Remarks

Claims 1-38 were originally filed. Claims 1, 4, 8, and 38 were previously amended, and Claims 7 and 36 were previously canceled.

Independent Claims 1 and 38 are being amended herein to clarify that the exposure step to effect multiphoton absorption and photoreaction (for example, to form a controlled or engineered defect) is an optional exposure step (which can be carried out if, for example, a defect-containing periodic dielectric structure is desired). Basis for this amendment can be found, for example, in Paragraphs [0012] and [0197] of the instant patent application publication.

Rejections Under 35 U.S.C. Section 103

Claims 1-6, 8-27, and 37-38 were rejected under Section 103(a) as being unpatentable over U.S. Patent Application Publication No. 2004/ 0012872 (Fleming et al., hereinafter referred to as Fleming) in view of U.S. Patent Application Publication No. 2003/0151032 (Ito et al., hereinafter referred to as Ito). This rejection is respectfully traversed for the following reasons.

Fleming describes methods for producing a region of at least partially reacted material in a photoreactive composition through multiphoton absorption. In one embodiment, such a method involves the use of an exposure system capable of inducing image-wise multiphoton absorption, wherein the exposure system includes three or more light beams to generate a non-random three-dimensional pattern of light using optical interference from the three or more light beams. The method further includes exposing a photoreactive composition to the three-dimensional pattern to at least partially react a portion of the material in correspondence with the non-random three-dimensional pattern of light incident thereon. (See Paragraph [0022], as well as Example 8 (which discusses the use of 3-beam interference to form multiple photopolymerized regions by a multiphoton absorption process).)

Ito describes dielectric-forming compositions comprising, for example, ultrafine particle-resin composite particles composed of inorganic ultrafine particles with average particle size of 0.1 micrometer or smaller and a resin component constituted of at least one of a polymerizable compound and a polymer. Part or all of the surfaces of the inorganic ultrafine particles are

coated with the resin component, and the ultrafine particle-resin composite particles contain 20 percent by weight or more of the inorganic ultrafine particles.

The Examiner has asserted that the difference between the instant claims and Fleming "is that Fleming does not disclose the use of a plurality of inorganic particles in the photoreactive composition. Ito . . . discloses the use of plural inorganic particles in the photosensitive composition. Therefore, it would be obvious to modify Fleming by including inorganic particles in the photoreactive composition as suggested by Ito because Ito . . . discloses that using inorganic particles in the composition enables improved permittivity."

In contrast with Fleming, Applicants' MBI exposure effects one-photon absorption and photoreaction. The combination of Fleming and Ito does not provide Applicants' claimed process for at least the reason that Fleming's MBI exposure effects multiphoton, rather than one-photon, absorption and photoreaction.

The Examiner has asserted that "Fleming, in [0043], discloses performing the same exposure to a single-photon photocurable composition i.e., the MBI can be used to expose single-photon photoreactive composition (photodefinable composition) to cause single-photon absorption and its corresponding photoreaction. Therefore, Fleming teaches both the possibilities . . . ." Paragraph [0043] of Fleming does not appear, however, to even mention MBI.

Rather, Paragraph [0043] appears to be a continuation of the comparison initiated in Fleming's Background section, which pointed out the key differences between two-photon induced photoprocesses and single-photon induced photoprocesses. Paragraph [0043] describes the common techniques used for exposing single-photon photodefinable materials, including projection lithography. Paragraph [0044] then explains that multiphoton processes typically require relatively high light fluence and that techniques for achieving such high light fluence by focusing high-energy laser light using a relatively high numerical aperture lens can provide good z-axis control of the multiphoton absorption process but can be slow and of limited precision.

Paragraph [0045] of Fleming then states (in reference to the exposure of a large area of multiphoton-absorbing material) that "[i]t is known that photopolymerization masks featuring projection optics would not have the z-axis focusing capabilities necessary to form complex shapes in three dimensions. The present invention discloses the use of mask configurations

wherein the light-transmitting regions include refractive elements, for example, capable of focusing the light so as to provide adequate z-axis definition."

Thus, Paragraphs [0043]-[0045] of Fleming appear to be merely comparing and contrasting the exposure system requirements for single-photon induced and multiphoton-induced photoprocesses. Fleming's invention appears to focus solely on multiphoton-induced processes. This focus is evidenced by the title of Fleming's application ("Multiphoton Absorption Method Using Patterned Light"), by the reference throughout Fleming's Summary and Claims to simultaneous absorption of at least two photons by the photoreactive composition, and by the reference throughout Fleming's Summary and Claims to an exposure system capable of inducing image-wise multiphoton absorption.

Additional evidence of this focus can be found throughout Fleming's Detailed Description. For example, Fleming's photoinitiator system is described in Paragraphs [0097] – [0177] as containing multiphoton photosensitizers in combination with photoinitiators and optional electron donors capable of interacting with the multiphoton photosensitizers. Single-photon photoinitiator systems do not appear to be described.

Note that this is in contrast with Applicants' specification, which expressly describes one-photon photoinitiator systems as well as multiphoton photoinitiator systems in, for example, Paragraphs [0048] – [160]. Paragraphs [0054] and [0197] of Applicants' specification explain that multiphoton photoinitiator systems can be preferred for use in Applicants' process (as noted by the Examiner), if an optional defect-writing step (prior to, or subsequent to, the MBI step) is desired. ("Multiphoton processes are particularly well-suited for the writing of structural defects, as such processes can have resolution below 150 nanometers and penetration depths that enable the creation of defects in the interior of a structure" (see [0197]).) Thus, Applicants' preference for the use of multiphoton photointiator systems is not said to be associated with the MBI step.

In contrast, the MBI disclosure of Fleming appears to be limited to Paragraph [0022] and Example 8, both of which focus on multiphoton absorption. Paragraph [0022] specifies "providing a source of sufficient light for simultaneous absorption of at least two photons by the photoreactive composition" and "providing an exposure system capable of inducing image-wise multiphoton absorption." Example 8 begins by stating that "[t]his example discusses the use of 3-beam interference to form multiple photopolymerized regions by a multiphoton absorption

process." Fleming therefore appears to describe MBI in connection only with multiphoton-induced absorption and photoreaction.

For the foregoing reasons, the combination of Fleming and Ito simply does not provide Applicant's claimed process, which specifies the use of MBI to effect one-photon absorption and photoreaction. Applicants therefore respectfully submit that their claims are indeed patentable over this combination of references and respectfully request that the rejection under Section 103 be withdrawn.

Claims 28-35 were rejected under Section 103(a) as being unpatentable over U.S. Patent Application Publication No. 2004/ 0012872 (Fleming et al., hereinafter referred to as Fleming) in view of U.S. Patent Application Publication No. 2003/0151032 (Ito et al., hereinafter referred to as Ito) as applied to Claims 1-6, 8-27, and 37-38, and further in view of U.S. Patent No. 4,406,992 (Kurtz et al., hereinafter referred to as Kurtz). This rejection is respectfully traversed for the following reasons.

Kurtz describes a semiconductor pressure transducer or other product employing layers of single crystal silicon. A single crystal silicon substrate is said to have a line grating formed on a surface, and a layer of dielectric is said to be thermally grown on the surface to replicate the line grating on an opposite surface of the dielectric. A layer of silicon is said to be deposited on the opposite surface. The layer of silicon is said to be of single crystal form due to the presence of the grating structure. The method employed is said to thus enable one to eliminate any intermediate glass bonding layer as well to eliminate polycrystalline structure. The structure and methods are said to result in extremely reliable apparatus capable of high temperature operation while possessing improved mechanical strength. (See Title, Abstract, and Brief Description of the Preferred Embodiment.)

The Examiner has relied upon Kurtz for its description of silicon deposition and has asserted that the subject matter of Claims 28-35 is obvious in view of the combination of Fleming, Ito, and Kurtz. As explained above, however, the combination of Fleming and Ito fails to provide Applicants' claimed process. The addition of Kurtz' silicon deposition does not overcome the deficiencies of Fleming and Ito, and thus the combination of Fleming, Ito, and Kurtz also does not provide Applicants' claimed process. Applicants therefore respectfully

submit that their claimed process is indeed patentable over this combination of references and respectfully request withdrawal of the rejection under Section 103.

Concluding Remarks

Reconsideration and allowance of Applicants' claims are respectfully requested.

Respectfully submitted,

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